the horizon in region space is shown in FIG. *6b*. Similarly, a second horizon **106** is represented in parameter space as shown in FIG. *6c*. A function, f_2 **108**, provides a mapping from parameter space to region space. The representation **110** of the horizon in region space is shown in FIG. *6d*. The subdivision of the region by the first horizon **104** and the second horizon **110** forms three sub-regions **112**, **114**, **116**, as shown in FIG. *6e*. Region **112** is the subregion below horizon **110**. Region **114** is the region between the two horizons, and region **116** is the region above horizon **104**. A material property, MP, is assigned a value represented by the function MP, **118** in region **112**. The material property is assigned a different function, MP_2 **120**, in region **114**. A representation of the value of MP **122** in region **112** is shown in FIG. *6f*. A representation of material property MP **124** in region **114** is shown in FIG. *6g*.

The process of simulation input model generation consists of an interactive phase in which the user specifies the size, location, and properties of a mesh or grid to be stored in a simulation input model description. The interactive phase is followed by an automated phase in which the simulation input model is built given the geoscience model and simulation input model description.

The invention may be implemented in hardware or software, or a combination of both. However, preferably, the invention is implemented in computer programs executing on programmable computers each comprising a processor, a data storage system (including volatile and non-volatile memory and/or storage elements), at least one input device, and at least one output device. Program code is applied to input data to perform the functions described above and generate output information. The output information is applied to one or more output devices, in known fashion.

Each program is preferably implemented in a high level procedural or object oriented programming language (such as C++ or C) to communicate with a computer system. However, the programs can be implemented in assembly or machine language, if desired. In any case, the language may be a compiled or an interpreted language.

Each such computer program is preferably stored on a storage media or device (e.g., ROM or magnetic/optical disk or diskette) readable by a general or special purpose programmable computer, for configuring and operating the computer when the storage media or device is read by the computer to perform the procedures described herein. The inventive system may also be considered to be implemented as a computer-readable storage medium, configured with a computer program, where the storage medium so configured causes a computer to operate in a specific and predefined manner to perform the functions described herein.

Other embodiments are within the scope of the following claims.

What is claimed is:

1. A method for modeling geological data sampled from a subsurface region, the geological data and an analysis of the geological data being stored in a geoscience model on a magnetic media, comprising

dividing the region into a first sub-region and a second sub-region by constructing a boundary between the sub-regions and wherein within each sub-region a material property varies without discontinuities;

storing on the magnetic media the shape of the boundary as a plurality of parametric functions whose parameter density can vary.

2. The method of claim **1** further comprising describing the variation of the material property within a sub-region with a parametric function.

3. A computer system for modeling geological data sampled from a subsurface region, the geological data and an analysis of the geological data being stored in a geoscience model on a computer-readable magnetic media, comprising

means for dividing the region into a first sub-region and a second sub-region by constructing a boundary between the sub-regions and wherein within each sub-region a material property varies without discontinuities;

means for storing on the magnetic media the shape of the boundary as a plurality of parametric functions whose parameter density can vary.

4. The computer system of claim **3** further comprising means for describing the variation of the material property within a sub-region with a parametric function.

5. A computer-readable medium having computer readable instructions for modeling geological data sampled from a subsurface region, the geological data and an analysis of the geological data being stored in a geoscience model on a magnetic media, comprising instructions for causing a computer to

divide the region into a first sub-region and a second sub-region by constructing a boundary between the sub-regions and wherein within each sub-region a material property varies without discontinuities;

store on the magnetic media the shape of the boundary as a plurality of parametric functions whose parameter density can vary.

6. The computer-readable medium of claim **5** further comprising instructions for causing a computer to model the variation of the material property within a sub-region with a parametric function.

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